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ABSTRACT

This document presents baseline data on physical fitness that provides an outline for assessing the physical fitness of students. It consists of 4 tasks and a 13-item questionnaire on fitness-related behaviors. The fitness test evaluates cardiorespiratory endurance by a steady state jog; muscular strength and endurance with a two-minute bent-knee curl-up; flexibility with a sit-and-reach test; and body composition with a two-site skinfold measurement. The measure uses criterion-referenced standards. The questionnaire includes descriptive items on sex, age, race/ethnic group, highest grade planned for completion, body frame, height, weight, and six items on fitness-related behaviors. (JD)

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ED323203

PHYSICAL FITNESS ASSESSMENT

By: Dr. Alice Valdes, State Supervisor
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Introduction

With increased understanding among health professionals of the importance and potential impact of preventative measures in improving the health status of Americans, many states have undertaken cooperative initiatives to advance health knowledge and healthful practices. The emphasis has been on prevention and maintenance of wellness.

Health in an individual is dependent on many factors including family history, personal characteristics, environmental conditions, exposure to disease and to one's own personal lifestyle. At least three components of personal lifestyle influence health-diet, health habits and fitness.

Although there is less than scientific certainty about many important aspects of maintaining health, the bulk of the evidence leads many health experts to recommend prudent use of available knowledge.

Many scientific studies over the past twenty years have supported the contribution of regular exercise as an essential part of a healthy lifestyle. There is documented evidence that a sedentary lifestyle is a contributing factor to major degenerative disease. According to the American Health and Fitness Foundation,

> "Regular, vigorous physical activity throughout life significantly reduces the risk of disability from stroke and heart disease. It can also effectively alter many of the important risk factors for cardiovascular disease by lowering body weight and total serum cholesterol levels, raising HDL "good " cholesterol, and promoting the maintenance of normal blood pressure. ...
> The benefits of regular exercise on psychological health have been clearly documented. ...More importantly, the vast majority of individuals who take up regular exercise report an improved sense of general well-being and enhanced self-image".

Yet several national surveys have shown that children and youth are considerably less fit than they ought to be. According to a nationwide federal study in 1984, only about half of the nation's students are getting enough physical activity to maintain effectively functioning cardio-respiratory systems.

In Delaware, the State Board of Education and The Department of Public Instruction have recognized the importance of prevention in promoting and maintaining health and the supporting role of the schools in advancing this understanding. Accordingly, they have joined with the Department of Health and Social Services to promote wellness.

In support of the State Board of Education's Wellness initiative the Delaware Educational Assessment Program undertook this assessment of Physical Fitness. It is important to know the current condition of physical fitness among Delaware students and to have baseline data to assist in judging the effectiveness and impact of health and health related initiatives.

The Physical Fitness Assessment

WHAT DID THE ASSESSMENT CONSIST OF?

The Physical Fitness assessment consisted of administration of the Fit Youth Today (FYT) health fitness test composed of 4 tasks and a 13 item questionnaire on fitness related behaviors. The FYT was developed by the American Health and Fitness Foundation.

FYT Health Fitness Test

This measure consists of 4 tasks designed to evaluate -

- cardiorespiratory endurance by a steady state jog
- muscular strength and endurance with a two-minute bent-knee curl-up
- flexibility with a sit-and-reach test
- body composition with a two-site skinfold measurement

This measure differs from typical fitness measures in that it does not use norm-referencing to judge relative fitness. It uses instead criterion referenced standards, set by a consensus of experts, at values that reflect the scientific literature and research and represent reasonable expectations for most children and youth.

Fitness Assessment Questionnaire

The 13 item questionnaire used items selected from The Statewide Adolescent Health Study conducted by the Delaware Division of Public Health in 1987. The items selected included 7 descriptive items on sex, age, race/ethnic group, highest grade planned for completion, body frame, height, weight and 6 items on fitness related behaviors.

WHO PARTICIPATED IN THE ASSESSMENT?

The assessment was conducted with a sample of ninth grade students in 9 schools in 8 districts throughout the state. Selected students were excluded if either the school nurse or parent recommended it.

Not all students participating in the Health Fitness Test completed the questionnaire, and not all students completing the questionnaire participated in the Health Fitness Test.

FYT Health Fitness Test

Three hundred ninety-two (392) students participated in the performance assessment. One-half were male and one-half female. For the 307 students for whom discriptive data are available, ages ranged from 13 to more than 18, the mode was 14 (162 students). By racial groups, the students were 71% White, 24% Black, 1% Hispanic, 2% Asian and 2% Other. Total statewide Grade 9 enrollments in 1988-89 were 69% White, 27% Black, 2.5% Hispanic, 1.4% Asian and <.2% Other. Seventy-six percent plan to attend college, 22% plan to complete grade 12, 2% plan to complete grades 9 or 10.

Fitness Assessment Questionnaire

Three hundred seventy-one (371) students completed the questionnaire. They differed from the performance test group in that a slightly higher percentage (+2%) were Black and a slightly lower percentage (-4%) plan to attend college.

WHEN WAS THE ASSESSMENT CONDUCTED?

The data collection took place between January 16, 1989 and March 17, 1989.

Fit Youth Today

Health Fitness Test

Description and Results

Cardiorespiratory Endurance and Aerobic Fitness

Is associated with

lower risk of:
- * coronary heart disease
- * high blood pressure
- * obesity
- * diabetes

higher sense of well-being

Was measured by

a steady state jog, a sub-maximal aerobic activity.

Students were instructed to jog at a steady rate throughout a 20 minute period. If students could attain the criterion referenced standard by walking rapidly or by a combination of walking and running that was acceptable.

Attainment of the standard indicates an adequate VO_2 max (maximal aerobic performance).

Standards were

20-Minute Steady State Jog Test
Criterion Referenced Standard

Distance Covered in 20 Minutes for Grades 7-12

	Yards	Minutes per Mile
Male	4220	8.3
Female	3870	9.1

Student Performance

Number of 9th Grade Students Attempting	STANDARD			
	Attained		Not Attained	
	#	%	#	%
392	8	2.0	384	98.0

	Mean # of Yards	Standard Deviation	Low Score	High Score
Males	3268.0	548.7	2053	4420
Females	2567.0	421.7	1670	3765

Abdominal Muscular Strength and Endurance

Is associated with

* reduced incidence of low back pain

Was measured by

the bent-knee curl-up test.
Successful attainment of the criterion referenced standard indicates a "fit" level of abdominal strength and endurance.

Standards were

Bent- Knee Curl-Up Test
Criterion Referenced Standard

Number of Curl-Ups Completed in Two Minutes for Grades 7-12

Males and Females	40

Student Performance

Number of 9th Grade Students Attempting	STANDARD			
	Attained		Not Attained	
	#	%	#	%
391	338	86.2	54	13.8

	Mean # of Curl-Ups	Standard Deviation	Low Score	High Score
Males & Females	59.2	18.7	13	117

Degree of Trunk Flexibility

Is associated with

* lower risk of skeletal imbalances which limit range of motion
* much lower risk of low back pain

Was measured by

the sit-and-reach test in which the student sits on the floor with legs fully extended and reaches as far forward as possible without bending the knees.

The farthest distance reached and held for at least 3 seconds in 4 trys is the score recorded.

Standards were

Sit-and-Reach Test
Criterion Referenced Standard

Farthest Distance Reached and Held for Three Seconds

All Grades and Both Sexes	9.0 inches

Student Performance

Number of 9th Grade Students Attempting	STANDARD			
	Attained		Not Attained	
	#	%	#	%
392	316	80.6	76	19.4

	Mean # inches	Standard Deviation	Low Score	High Score
Males & Females	11.5	3.2	0	19.5

Body Composition- Body Fat

Is associated with

Obesity which is an important factor for:

* cardiorespiratory disease
* diabetes
* liver and kidney diseases
* shortened life span

Was measured by

skinfold thicknesses at two sites: 1) the back of the arm (tricep) and 2) the medial calf. These measures were added and compared to the standard. Three measures were made for each site and the median value was recorded.

The standard has been set at an achievable value rather than at an ideal value. The standards are at the upper limits of acceptability.

Standards were

Body Composition
Criterion Referenced Standard

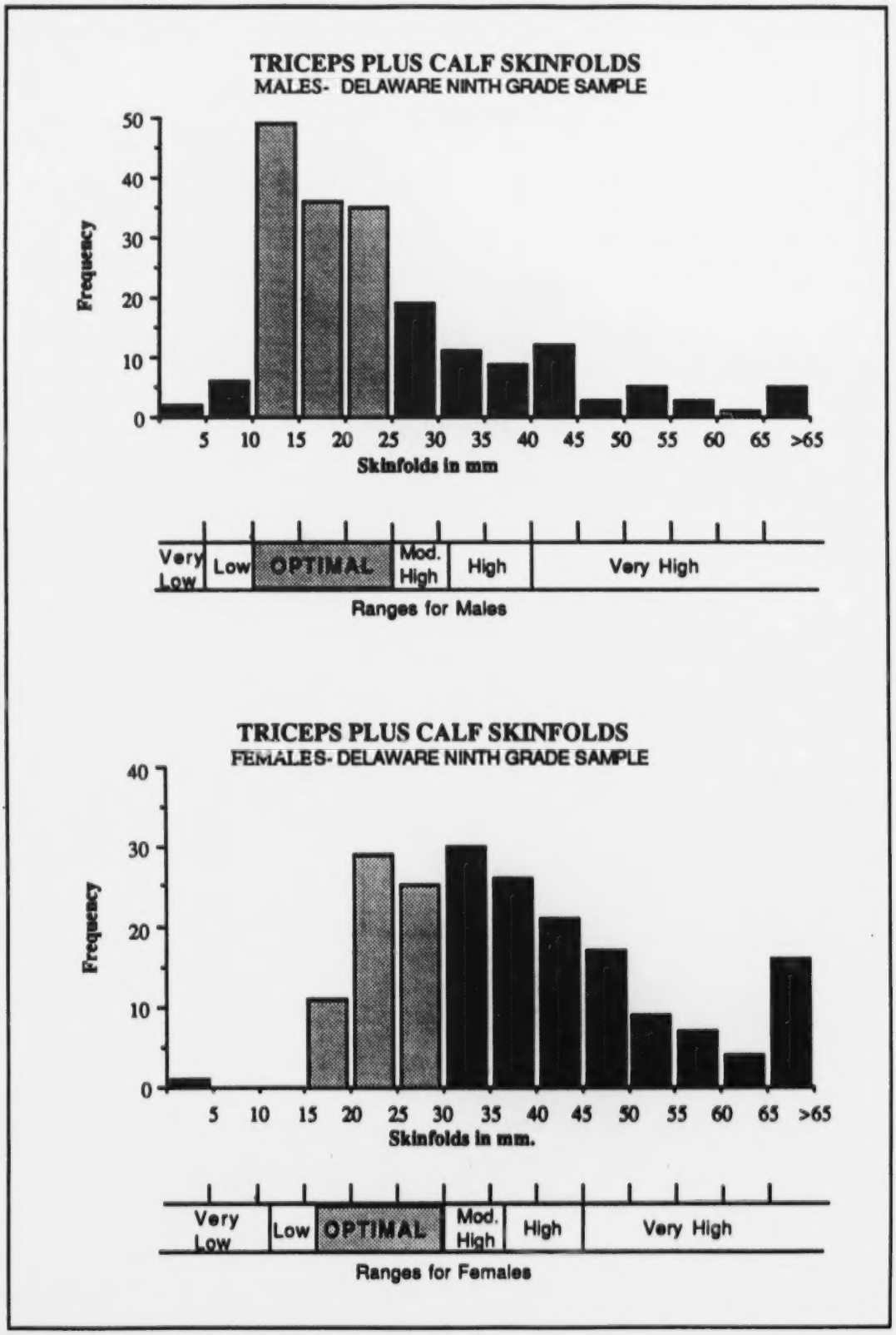
Sum of Calf and Tricep Measures

Males	27 mm
Females	34 mm

Student Performance

Number of 9th Grade Students Attempting	STANDARD Attained #	Attained %	Not Attained #	Not Attained %
392	238	60.7	154	39.3

	Mean # mm	Standard Deviation	Low Score	High Score
Males	24.2	15.0	2	86
Females	37.7	15.5	2	97


TRICEPS PLUS CALF SKINFOLDS
MALES- DELAWARE NINTH GRADE SAMPLE
Frequency
50
40
30
20
10
0
5 10 15 20 25 30 35 40 45 50 55 60 65 >65
Skinfolds in mm
Very Low
Low
OPTIMAL
Mod. High
High
Very High
Ranges for Males
TRICEPS PLUS CALF SKINFOLDS
FEMALES- DELAWARE NINTH GRADE SAMPLE
Frequency
40
30
20
10
0
5 10 15 20 25 30 35 40 45 50 55 60 65 >65
Skinfolds in mm.
Very Low
Low
OPTIMAL
Mod. High
High
Very High
Ranges for Females

Summary

STUDENTS ATTAINING CRITERION STANDARD FOR :		PERCENT
	CARDIORESPIRATORY ENDURANCE	2.0
	ABDOMINAL STRENGTH	86.2
	TRUNK FLEXIBILITY	80.6
	BODY COMPOSITION	60.7

STUDENTS ATTAINING CRITERION STANDARDS ON :		NUMBER	PERCENT
	ALL 4 MEASURES	7	1.8
	3	165	42.1
	2	163	41.6
	1	53	13.5
	0	4	1.0

Less than 1/2 the students attained criterion standards on at least 3 measures.

Fitness Assessment Questionnaire

Description and Results

Fitness Assessment Questionnaire

In addition to descriptive information the questionnaire asked for information on six items pertaining to fitness related behaviors.

Students were asked about -

- knowledge of family history -
  one aspect of personal risk assessment
- eating breakfast
- walking for exercise
- participation in aerobic exercise activities
- participation in recreational activities
- smoking

Personal Risk

Health experts have advanced personal risk assessment as an important concept for adults, youth and children. Understanding the increased risk for debilitating health conditions associated with family history, nutritional and dietary practices, occupational hazards, and health practices can enable people to make informed choices about those risk factors that are amenable to change. For example, a person with a family history of high blood pressure, cardiovascular disease, diabetes or obesity has an increased risk of developing these conditions. Risk factors not associated with family history include smoking, high-fat diet and lack of exercise. Health experts maintain that it is important for individuals to know of personal risk factors and that it is highly advisable for high-risk individuals to consider lifestyle changes to reduce risk. These include reducing fat in the diet, controlling weight, restricting salt, abstaining from smoking and exercising routinely.

	Question:	Ninth Graders	
		Number	Percent
Knowledge of Personal Risk Factor	*Has a blood relative (parent, grandparent, brother, or sister) had either a heart attack, high blood pressure, or diabetes before the age of 60?*		
	Yes	173	47
	No	105	29
	Don't Know	90	24
	TOTAL	368	100

Seventy-six percent of ninth grade students report knowing about family history in relation to heart attacks, high blood pressure and diabetes.

Nutrition

It is well-known that both body and brain require food for energy. Neglecting to eat breakfast can result in feeling tired and sluggish, not in the alert condition required for concentration on schoolwork.

	Question:	Ninth Graders	
		Number	Percent
Nutrition	*How many days in a typical week do you eat breakfast?*		
	Everyday	129	35
	5 or 6 days a week	37	10
	2 to 4 days a week	86	23
	1 day or none	119	32
	TOTAL	371	100

Less than half of the ninth graders report eating breakfast at least 5 days a week.

Walking

Many scientific studies over the past 20 years have supported the contribution of regular exercise as an essential part of a healthy lifestyle. There is documented evidence that a sedentary lifestyle is a contributing factor to major degenerative disease. According to the American Health and Fitness Foundation, "Regular, vigorous physical activity throughout life significantly reduces the risk of disability from stroke and heart disease. It can also effectively alter many of the important risk factors for cardiovascular disease by lowering body weight and total serum cholesterol levels, raising HDL "good" cholesterol, and promoting the maintenance of normal blood pressure". There is substantial research evidence that exercise habits and levels of fitness established during childhood and adolescence are likely to carry over into adulthood.

	Question:	Ninth Graders	
		Number	Percent
Walking For Exercise	*How often do you walk at least one mile without stopping?*		
	Daily	69	19
	At least 3 times a week	68	19
	Seldom	181	50
	Never	43	12
	TOTAL	361	100

Less than half of the ninth graders reported walking at least a mile at least 3 times weekly without stopping. Sixty-two percent reported they seldom or never do. Walking, if strenuously done, qualifies as an aerobic exercise.

Aerobic Exercise

To attain aerobic fitness, exercise providing a heart rate of 145-185 beats per minute, should be done for at least 20 minutes 3 to 4 times a week.

	Question:	Ninth Graders	
		Number	Percent
Aerobic Exercise*	*Aerobic exercise is any physical activity that greatly increases both heart rate and breathing. Aerobics can include exercising, jogging, swimming, jumping rope, cross country skiing, brisk walking, or other strenuous activities. How often do you get at least 20 minutes of non-stop exercise?*		
	Daily	88	24
	At least 3 times a week	84	23
	Once or twice a week	80	22
	Seldom	78	22
	Never	31	9
	TOTAL	361	100

* Aerobic activities are those that require large amounts of oxygen, and are done continuously for long periods of time.

Less than half of ninth graders report engaging in aerobic exercises at least three times a week.

Recreational Activities

Vigorous participation in many recreational activities also qualifies as aerobic exercise.

	Question:	Ninth Graders	
		Number	Percent
Recreational Activities For Exercise	*How often do you participate in recreational activities such as bowling, golf, tennis, basketball, softball, dancing and similar activities?*		
	Daily	133	37
	At least 3 times a week	76	21
	Once or twice a week	74	20
	Seldom	67	19
	Never	11	3
	TOTAL	361	100

Less than 60% of ninth graders report engaging in vigorous team activities at least 3 times/week.

Smoking

The benefits of not smoking and the consequences of smoking have been broadly publicized for several years.

	Question:	Ninth Graders	
		Number	Percent
Smoking	*How many cigarettes (tobacco) do you smoke?*		
	None, I have never smoked	286	79
	None, I quit smoking	41	11
	A pack or less per week	15	4
	More than a pack per week but less than a pack per day	11	3
	One pack per day	6	2
	Between 1 and 2 packs per day	1	<0.5
	Two or more packs per day	1	<0.5
	TOTAL	361	100

Ninety percent of ninth graders report they do not smoke.

Conclusions and Recommendations

Delaware ninth grade student performance on the four physical fitness tasks was mixed. More than 80% of the students met the performance criterion for abdominal strength and trunk flexibility and 60% met the criterion for body composition. Of concern is the very low percentage of students meeting the criterion for cardiorespiratory endurance, the most vital of the performance areas assessed. Of concern also is the fact that less than half of students attained the criterion standards on at least 3 measures.

Student responses to the six questionnaire items pertaining to fitness related behaviors are also mixed. It is encouraging that ninety percent of the ninth graders report they do not smoke. Seventy-six percent report knowing about family history that may affect personal risk assessments. Student responses to questions pertaining to participation in activities that promote cardiorespiratory endurance and aerobic fitness however indicate undesirably low participation rates, less than 50% in walking and other aerobic exercises and less than 60% in strenuous recreational activities.

It is recommended that:

The Department of Public Instruction encourage schools to reexamine the purpose and accomplishments of physical and health education programs in grades K-12.

Community groups sponsor voluntary aerobic events for students. These groups should consider the value of incentives in getting students to participate.

Health groups and health agencies emphasize dissemination of information on health benefits and risks to adolescent and pre-adolescent children in regard to physical fitness and healthful practices.

The media assist in raising awareness among parents of health risk factors and healthful practices in the home.

Appendix

Methodology

Sampling Strategy

During the summer of 1988, an intern from the University of Delaware, Department of Mathematical Sciences was employed by the Delaware Department of Public Instruction, Division of Research and Evaluation to develop a sampling strategy that would efficiently provide state estimates for purposes of assessment.

The strategy developed was a stratified two stage sampling process. The first stage involved the selection of schools while the second concerned the sampling of students within selected schools. In the first stage the population of schools was to be stratified using a clustering procedure. This was to be followed by selection of the particular set of schools that would represent each stratum with larger samples of schools to be taken for larger stratum. In the second stage, a fixed quota of students, by school, was to be established and finally students were to be selected using a systematic random sampling procedure.

Sample Selection

School principals in the nine high schools were asked to provide 9th grade student rosters to the Educational Assessment Program. A table of random numbers was used to determine an entry point for the lists. Students were selected until the fixed quota plus 5% was reached. The 5% overage was intended to compensate for student absences on the day scheduled for testing.

A list of students was prepared for each school. Because the test involved strenuous physical activity, the lists were submitted to school nurses for review to identify students who should not be asked to participate based on the nurse's knowledge of the students. Names of these students were eliminated from the lists, replacements were drawn and nurses reviewed names of replacements. Letters were then sent to parents/guardians of each student giving parents the opportunity to exempt students from the assessment. Replacements for these students were selected and final student lists were sent to schools.

Instrumentation

Two instruments were used in the assessment - the Fit Youth Today (FYT) performance test and a 13 item questionnaire.

The FYT performance test is published and distributed through the American Health and Fitness Foundation as part of a Physical Fitness Program. The program was developed over a four year period by health fitness professionals. The program is endorsed by the American College of Sports Medicine.

The questionnaire was composed of 13 items selected from a survey form used by the Delaware Division of Public Health in 1987 in conducting The Statewide Adolescent Health Study.

Data Collection Procedures

In order to minimize disruption in schools and classes due to student sampling and to ensure comparability of data from place to place and examiner to examiner, an external team of trained persons was used to administer the performance tests.

The data collection team was composed of students from the University of Delaware, College of Physical Education, Athletics and Recreation working under the direct supervision of Dr. James W. Kent, Associate Professor in the College.

Necessary equipment was prepared and/or assembled by the data collection team. Dr. Kent trained the student team in procedures to be followed. All procedures were pilot tested in one high school prior to actual data collection. It was determined at this time that distribution and collection of the questionnaire in conjunction with the performance assessment consumed too much time. In the pilot it was also ascertained that students had difficulty pacing themselves for the Steady State Jog test. It was decided that the data collection team would demonstrate the pace required by the standard for both males and females prior to beginning the test.

Each school principal was contacted to identify any day(s) unsuitable for the assessment in the prescribed time period. A master calendar was prepared identifying dates for the assessment at each school. Each principal indicated a desire to schedule students by groups for the assessment and a willingness to distribute and collect questionnaires.

Since the assessment was conducted during winter months all exercises were administered indoors. The space required was one volleyball count with a 3-5 foot buffer zone.

Schools and the data collection team were advised of the necessity of having the school nurse and athletic trainer in the building on the date of the assessment.

Time for the performance assessment was estimated at about 1 hour for groups of 16. In actuality slightly more time was required because of the necessity of students changing into and out of gym clothes and showering after the assessment.

School nurses, health teachers and physical education teachers assisted with the coordination and supervision of students in most schools.

Analysis of the Data

Data were analyzed using the Stat View 512+ Statistical package for the Macintosh II.

Frequency distributions were generated for all variables. Descriptive statistics were generated for raw score distributions on the performance measures.

We can assert with 95% confidence that population means fall between the following values:

Cardiorespiratory endurance	-	2857.9 and 2977.1
Abdominal Strength	-	57.3 and 61.0
Trunk Flexibility	-	11.2 and 11.8
Body Composition	-	29.3 and 32.6